5-E-39

narda Microline®

INSTRUCTION MANUAL
NARDA MODELS 830 AND 833
ECHO BOXES

E522

VIKING LABORATORIES INC.

PRECISION MICROWAVE AND RF TEST EQUIPMENT

THE NARDA MICROWAVE CORPORATION, PLAINVIEW, L. I., N. Y. 11803 • 516 GE 3-9000

[redacted]

INSTRUCTION MANUAL

NARDA MODELS 830 AND 833

ECHO BOXES

VIKING LABORATORIES INC.

98210150

March 1970

VIKING LABORATORIES INC

INSTRUCTION MANUAL

NARDA MODELS 830 and 833

ECHO BOXES

This Manual lists the electrical specifications of the NARDA Model 830 and 833 Echo Boxes, describes the uses of the Echo Boxes, including the measurement of overall radar performance, and also includes notes on servicing the Echo Box and a brief trouble shooting chart.

Specifications

	Model 830	Model 833
Frequency Range	9340 - 9410 Mc.	5350 - 5450 Mc.
Loaded Q	75,000 minimum	50,000 minimum
Frequency Accuracy	± 2mc.	± 1mc.
Meter Sensitivity	25 Microamperes	25 Microamperes

Application Notes

Checking Overall Performance of a Radar: Radar performance is checked by connecting a Type N cable from the radar directional coupler to the input jack of the Echo Box. The Echo Box is tuned to the transmitter frequency and the radar scope is observed. A sketch of a typical PPI presentation is shown in Figure 1, and a typical A-scope presentation in Figure 2. The darkened area on

VIKING LABORATORIES INC.

the PPI represents the ring time of the Echo Box; the ring time is indicated also for the A-scope presentation in Figure 2.

Ring time is approximately four miles or 45 microseconds for the RCA C-Band Weather Radar when the radar is performing at its rated power of 75 kilowatts, and when the receiver has the rated sensitivity of -100 dbm., ring time is approximately 2.5 miles or 28 microseconds for the Bendix X-Band Weather Radar.

Each Echo Box must be individually calibrated against a known operating radar in order to obtain an accurate indication of peak system performance. It is recommended that the Echo Box be checked monthly to assure no deterioration in performance.

Note: The Model 830 has a spurious response in the range 9200-9300 megacycles. This will cause a spurious meter reading of large amplitude, and a small echo to the radar.

Measurement of Transmitter Power: A relative indication of transmitter power may be obtained from the microammeter contained in the Echo Box. This reading is directly proportional to transmitter power and may be calibrated for each Echo Box individually by comparing it with a known radar reading. If the Echo Box crystal is replaced, this calibration will change.

TR Performance: The performance of the transmit-receive tube may be detected using an A-scope presentation. The symptom of poor TR recovery time is a trace on the oscilloscope similar to that shown in Figure 3.

Spectrum Analysis: The Q of the Echo Box is high enough so that an approximate spectrum analysis may be made of the transmitter pulse. The half power band width of the Echo Box is approximately 100 kc., and a spectrum analysis may be made with 100 kc. resolution. The spectrum analysis is made by slowly tuning the Echo Box through the region approximately 2 mc. on either side of the transmitter frequency and recording the meter reading as a function of frequency. When these readings are plotted, a crude spectrum analysis will result. A comparison of a good spectrum analysis taken with an Echo Box and compared with the true spectrum of the same pulse is shown in Figure 4.

Radar Trouble Shooting Chart

Symptoms	Cause	Correction
Shortened ring time, lower meter reading.	Transmitter power low.	Check transmitter to determine source of trouble.
Shortened ring time, no other symptom.	Mixer crystal failing or poor receiver sensitivity.	Replace crystal.* If no improvement, check receiver.
Normal ring time, deep notch in A-scope presentation following transmitter pulse.	Poor TR recovery, or receiver recovery.	Replace TR tube. If no improvement, check receiver.
Shortened ring time, poor spectrum.	Magnetron not pulsing correctly, or being pulled by mismatched load.	Check plumbing for mismatch, and pulser for jitter.

* See Servicing the Echo Box for replacement procedure.

Servicing the Echo Box

1. Crystal Replacement: Occasionally the crystal detector built into the Echo Box cavity must be replaced. The following procedure should be followed to replace the crystal.
   a. Remove the four binding head screws in the corners of the panel.
   b. Remove the two binding head screws in the rear of the case bottom.
   c. Withdraw the panel from the case.
   d. On the Model 830, unscrew the metal cap opposite the BNC connector on the Echo Box detector.
      On the Model 833, unscrew the black phenolic cap with the turret lug.
   e. Replace the crystal with a new 1N23B crystal.

2. Meter MARION Model MM-2 0-25 microammeter.
3. Potentiometer OHMITE (AB) CU1031.
4. No attempt should be made to repair a damaged cavity or gear drive mechanism. The Echo Box should be returned to THE NARDA MICROWAVE CORPORATION for repairs.

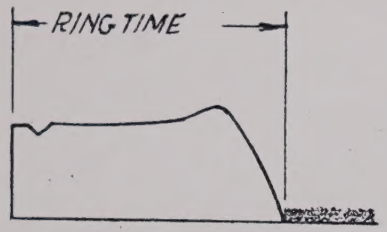
A schematic diagram of the Echo Box is shown in Figure 5.

VIKING LABORATORIES INC.

1.

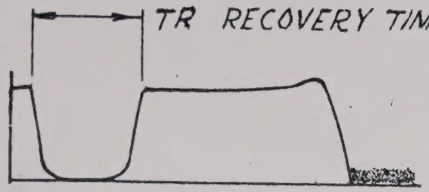
PPI RADAR PRESENTATION
WITH ECHO BOX TUNED

2.



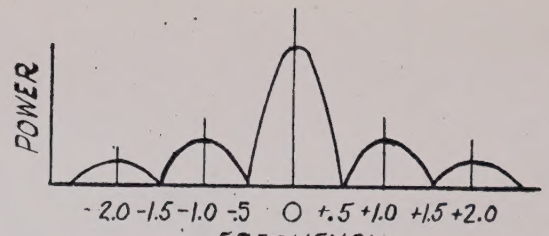
"A" SCOPE PRESENTATION
SHOWING ECHO FROM ECHO BOX.

3.

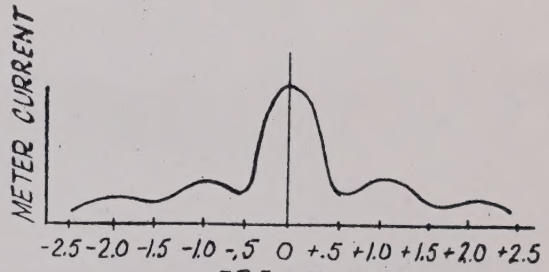


"A" SCOPE WITH TR PARTIALLY INOPERATIVE

4.

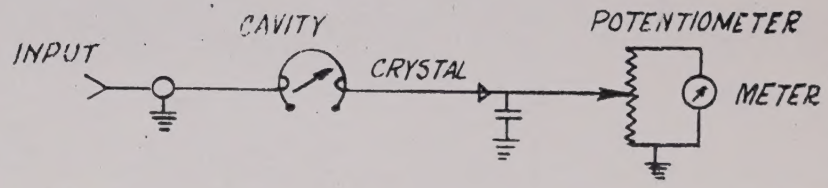


TRUE SPECTRUM
OF PERFECT PULSE



SPECTRUM FROM PLOT OF METER
CURRENT FOR PERFECT PULSE

5.



SCHEMATIC DIAGRAM, NARDA MODEL 833 ECHO BOX

VIKING LABORATORIES INC.